

# **IDAHO**

## **FISH & GAME DEPARTMENT**

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MACKAY RESERVOIR FISHERY INVESTIGATIONS

1974 by

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## Mackay Reservoir Fishery Investigation, 1974

### ABSTRACT:

Drawdown of 44,500 acre-foot Mackay Reservoir has reduced storage water to below 1,600 acre feet in three of the last eight years, namely 1967, 1969, and in 1973, when the minimum level was 900 acre-feet on October 1.

An estimated 8,909 anglers fished 27,178 hours during the year for 15,361 rainbow trout, 985 brook trout, 4 cutthroat trout, and 308 kokanee. Rainbow trout averaged 11.1 inches, brook trout 10.2 inches, and kokanee 11.5 inches total length. Some 40 percent of the rainbow trout were recently stocked hatchery-reared fish.

Fishing quality was relatively poor during 1974, averaging 0.61 salmonids per hour. Factors combining to lower the quality both in numbers and size of fish were: (1) The heavy drawdown in the fall of 1973 caused many fish to be lost through the outlet into Big Lost River and virtually wiped out benthic food organisms such as midge larvae and pupae. (2) Flushing, turbidity, and reduced photosynthesis accompanying the heavy runoff during 1974 prevented normal production of Daphnia which is usually the major food item during years following heavy drawdown.

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## **RECOMMENDATIONS:**

1. The annual planting of 150,000 fingerling rainbow trout in July should be enough to sustain a fishery consistent with natural productivity, provided the reservoir is not drawn below the 5,000 acre foot level (gage height 6,023). If the reservoir is drawn below this level, many fish are lost through the outlet and natural productivity is greatly impaired. Following heavy drawdown years, up to 10,000 hatchery-reared catchable-size rainbow trout should be stocked during the early summer period.

2. An annual plant of 100,000 kokanee fry in lower Warm Springs Creek is needed to provide a kokanee fishery in Mackay Reservoir. Kokanee observed in the 1974 harvest had better color and average size than trout. The oligotrophic habitat is better suited to production of kokanee than trout. Kokanee spawners and fry utilize Warm Springs Creek and other tributaries during the period when flows are not being diverted for irrigation.

3. Year round angling in Mackay Reservoir would benefit harvest of hatchery-origin fish. Fish leaving Mackay Reservoir through the outlet or inlet streams are largely lost to the angling public. The level of Mackay Reservoir fluctuates according to irrigation needs, making establishment of a self-sustaining salmonid population unlikely because of loss of fish through the outlet and disruption of the food chain.

## **OBJECTIVES:**

Collect creel and other fishery management information at Mackay Reservoir during 1974 to provide estimates of numbers of anglers, their methods of fishing and harvest of fish, quality of fishing and source of fish.

## **PROCEDURES:**

Boat and shore fishing parties were non-selectively interviewed to determine numbers of anglers, hours fished, and numbers and lengths of each species of fish caught. Some 11.6 percent of the estimated number of anglers at Mackay Reservoir during 1974 were interviewed. Daily check periods were preselected to avoid weather bias. Though lawful, night time fishing rarely occurred; length of the fishing day was sunrise to sunset. Most angler and boat counts were made during the late morning to late afternoon but average counts at all hours of the fishing day were weighted equally in estimating numbers of fishermen and boats.

Saturdays, Sundays and holidays were lumped and sampled separately as were other days of the week. For example, determining the estimate number of boat anglers during regular weekdays in July (539) was done as follows: average number of rods per boat (2.96) multiplied by weighted mean boat count on weekdays (1.78) multiplied by the average number of daylight hours in July (15) divided by the average number of hours fishing boats were on the reservoir (3.23) multiplied by the number of non-holiday weekdays in July (22).

The stomach contents of 161 rainbow trout, 44 brook trout, and 12 kokanee were non-selectively collected during the April 25 to October 22 period and analyzed at monthly intervals to sample food relationships in Mackay Reservoir.

Plankton was sampled infrequently by vertical hauls with a Wisconsin plankton net to roughly determine the period of Daphnia abundance, as Daphnia was suspected of being a major food item.

Vertical water temperature regimes were determined with an electrical resistance thermometer.

## **INTRODUCTION:**

Mackay Reservoir is a fluctuating irrigation supply reservoir located four miles northwest of Mackay, Idaho, in Custer County. Drainage area is 788 square miles, lying at elevations of six to twelve thousand feet. The dam is an earth-rock structure built in 1917-18 across the Big Lost River. Spillway elevation is 6,066.5 feet, msl; maximum depth is about 66 feet. Storage capacity of the three mile long, 3/4 mile wide reservoir is about 44,500 acre feet, of which only about 125 acre feet is dead storage. Major tributary streams are Big Lost River and Warm Springs and Parsons Creeks, all entering the upper (west) end of the reservoir. At the spring and early summer stage, approximately 40 percent of the seven mile long shoreline is privately owned, including the dam and mouths of the aforementioned tributaries. During late summer and fall the shoreline is reduced to about five miles in length, about one-half of which is private lands. The United States Department of Interior, Bureau of Land Management administers the public lands which are scattered laterally along each side of the reservoir and maintains a large modern recreation site on the north shore adjacent to State Highway 93A. Most of the north shoreline is easily accessible by side roads from the highway. The south shore has natural protection from prevailing southwesterly winds but is virtually inaccessible except by boat.

The reservoir is ice-covered during about five months each year, November to April. Aquatic productivity is adversely affected by drawdown and the comparatively large volume of water passing through the reservoir each year with intermittent turbidity and erratic plankton blooms. Annual runoff is some five times the storage capacity.

Fish tagging and marking studies were conducted by the Department of Fish and Game during 1960. Very little emigration occurred through the out-let channel until storage was reduced to 4,600 acre feet on July 27; loss of fish was most pronounced after the reservoir reached dead storage on August 12.

Minimum storage has dropped below 1,600 acre feet in three of the last eight years, namely 1967, 1969 and 1973. During 1973 the minimum was 900 acre feet on October 1. After refilling to about 8,000 acre feet, the lake was restocked with 55,902 fingerling rainbow trout on October 29, averaging 2 1/4 inches in length. Because these fish were subcatchable size when the

fishing season opened May 24, 1974 and drawdown had likely decimated other fish, an additional 13,740 catchable-size rainbow trout averaging nine inches in length were planted between May 16 and July 24. Mandible tags were placed on 390 of these fish, approximately 100 in each load. In addition, 157,440 fingerling rainbow trout, averaging 3.4 inches long, were planted July 24; 50,000 of these were marked for future identification by removal of the adipose fin.

## **FINDINGS:**

### Fishery

Examination of some 800 creel rainbow trout during 1974 indicated approximately forty percent of the catch was from catchable-size plants. Some seven percent of the tags placed on catchables were returned voluntarily by fishermen, all of which were recovered from the reservoir fishery.

Adipose-clipped rainbow trout began showing in the creels in August. During September and October, 12 were examined, averaging 7.4 inches in length. Trout from this plant probably will make up a large portion of the harvest during 1975.

The minimum storage in 1974 was 7,088 acre feet on October 16 (22 feet deep; 500-600 acres in area). This was well above the level where emigration is considered to have an appreciable effect on fishing quality.

The stratified-sample creel census in 1974 provided estimates of 8,909 fishermen who fished 27,178 hours for 16,658 game fish, including 15,361 rainbow trout, 985 brook trout, 4 cutthroat trout, and 308 kokanee (Tables 1 and 2). Comparable estimates of 1960, the only other year of record, are 23,000 hours, 16,000 rainbow trout, and 895 brook trout. Comparative hourly fishing success rates were 0.73 in 1960 and 0.61 in 1974.

During 1974 fishermen using boats had better success than shoreline anglers, 0.80 and 0.31 fish per hour, respectively. Fishing quality was typical of Eastern Idaho reservoirs, requiring some two hours to catch a trout during the spring and early summer, three hours during the last half of the summer, and reaching a peak of nearly one trout per hour in October. Approximately 60 percent of the angling effort was from boats.

Most fishermen were residents of Bingham and Bannock Counties. Only about five percent were from out-of-State.

The 15,360 rainbow trout made up 92 percent of the estimated catch. The 801 rainbows that were measured averaged 11.1 inches (1/2 pound) and ranged from 5 1/2 to 18 1/2 inches in length.

Brook trout made up six percent of the fish harvested; an estimated 985 were caught. The 94 that were measured ranged from 7 to 15.4 inches and Averaged 10.2 inches in length (0.4 pounds). No brook trout have been planted in the Big Lost River drainage basin during recent years. Brook trout

Table 1. Total estimated numbers of anglers and harvest of fish, Mackay Reservoir, 1974

Census Period	Parties	Anglers		Rainbow	Brook	Kokanee
		Resident	Nonresident			
May 25 - 27	323	1,025	60	2,440	401	106
May 28 - June 30	640	1,516	118	2,256	251	63
July (1)	679	1,758	112	2,352	162	33
August	714	1,734	74	1,483	37	27
September - November	<u>1,019</u>	<u>2,398</u>	<u>114</u>	<u>6,830</u>	<u>134</u>	<u>79</u>
TOTALS (1)	3,375	8,431	478	15,361	985	308
		8,909				

(1) Also includes 4 cutthroat

Table 2. Total estimated angler hours, salmonids harvested, and fishing success, Lackay Reservoir, 1974

Census Period	Angler Hours	Salmonids	Salmonids per Hour
May 25-27	5,029	2,947	0.59
May 28-June 30	4,540	2,570	0.57
July	5,725	2,551	0.45
August	4,730	1,547	0.32
September-November	<u>7,104</u>	<u>7,043</u>	<u>0.99</u>
TOTALS	27,178	16,658	0.61



in the reservoir fishery apparently entered the lake from upstream waters, some of which support brook trout as the dominant fish.

An estimated 308 kokanee were harvested from Mackay Reservoir, making up less than two percent of the catch. Greater numbers were harvested from the tailwaters of Mackay Dam, apparent migrants out of the reservoir. The 39 that were measured ranged from 9 to 17 inches in length and averaged 11.5 inches (1/2 pound). These kokanee probably originated from fry plants made in 1972 and/or natural spawning in Warm Springs Creek.

An overnight experimental gill net set near the spillway on April 24 took the following numbers and sizes of fish: 44 rainbow trout, 6.8 to 13.3 inches long and averaging 9.1 inches; 22 brook trout, 7.4 to 12.3 inches long and averaging 9.1 inches; 4 mountain whitefish, 8.5 to 13.1 inches long and averaging 11.3 inches.

The high incidence of brook trout in the gill net (1/3 of the trout) supports the assumption that emigration had decimated the trout population during the 1973 drawdown. Brook trout made up only 12 percent of the 102 fish taken in gill nets in May 1973. Brook trout are recruited to the reservoir from tributary streams during the winter period whereas hatchery stocks are the source of most of the rainbow trout population, spending some 12 months in the reservoir before reaching catchable size.

#### Water temperature

No thermocline was detected in Mackay Reservoir during the infrequent observations. Bottom-to-surface temperatures were 42-43°F on April 24, 47-56 on June 14, 55-62 on July 16, 54-61 on September 1 and 50-51 on October 2. The lake was usually buffeted by stiff breezes that stirred lake waters, discouraged boat launching, and, in general, made fishing difficult. Surface water temperatures remained well below the upper tolerance limits of all species of game fish found in the reservoir.

#### Plankton

Vertical hauls with a Wisconsin plankton net were made from 40 feet to the surface over the deepest part of the reservoir at approximate monthly intervals from April 25 to September 1. Because maximum depth was less than 40 feet in October, hauls were from 20 feet to the surface. Daphnia, the only plankter of importance as a fish food, was almost non-existent until mid-July, probably because of slow warming of the reservoir and the varying turbidity of inflowing streams. Daphnia numbers varied from 2 to 3 per liter during the fall months, the only period that they appeared to be important as a trout food during 1974.

#### Food relationships of game fish

Feeding by rainbow trout was heaviest in September, averaging 3.4 grams per stomach, large Daphnia. Snails and algae were major food items during the summer, possibly due to a paucity of other foods during that period. No fish or fish remains were found in the 161 rainbow trout stomachs (Table 3).

Table 3. The food of 161 rainbow trout from Mackay Reservoir, 1974, expressed as percentage of volume

Sampling period:		April	May	June	August	September	October	April-October
Number sampled:		44	32	14	32	7	32	161
Volume of food (grams):		11.3	20.4	14.9	56.4	23.8	30.7	157.5
<u>Food:</u>								
Plant material		24	22	22	28	-	-	17
Leeches		-	trace	trace	-	-	trace	trace
Earthworms (non-bait)		59	-	22	-	-	-	6
<u>Daphnia</u>		-	-	-	35	97	57	38
Scuds		1	trace	-	-	-	1	trace
Mayfly nymphs		-	5	7	-	-	trace	1
Stonefly nymphs		-	5	7	-	-	trace	1
Caddisfly larvae		-	8	-	trace	-	-	1
Aquatic beetles		-	1	1	-	-	trace	trace
Crane-fly larvae		-	1	1	-	-	-	trace
∞	Midges (mostly immature)	13	56	trace	1	3	41	17
	Terrestrial insects	2	2	-	-	-	-	trace
	Molluscs	1	-	40	35	-	1	17

Forage fish, mostly speckled dace, made up 70 percent of the volume of food found in brook trout stomachs (Table 4).

Earthworms were the commonly used baits; however, appreciable quantities of earthworms appeared to be natural foods of rainbow and brook trout. Most of the leeches observed in trout stomachs were small immature stages.

Mackay Reservoir was relatively unproductive during 1974 because (1) turbidity and flushing associated with excessive runoff, and (2) paucity of bottom organisms (benthos) following the 1973 drawdown which exposed most of the reservoir bottom to desiccation. Despite the drawdown, midges and molluscs were the most important foods of rainbow trout, kokanee, and mountain whitefish. Immature aquatic stages of stream-dwelling stoneflies, mayflies, caddis flies, beetles and crane flies were common fish foods and likely were washed into the reservoir with runoff waters.

#### Methods of fishing

Some three-fourths of the fishing effort at Mackay Reservoir during 1974 was still fishing with earthworm bait, either from shore or from anchored boats (Table 5). Some 65 percent of the rainbow trout, 94 percent of the brook trout and 64 percent of the kokanee were taken by this method. Other baits (salmon eggs, corn) were used occasionally.

Some 20 percent of the fishing effort was trolling pop gear, usually with a piece of earthworm or kernel of corn as terminal bait. About 26 percent of the rainbow trout, 31 percent of the kokanee, and 2 percent of the brook trout were taken by this method, which also had the highest average success rate of any method sampled, 0.63 fish per hour.

Fishing with lures such as spoons, wobblers and flatfish appeared to be more effective than with earthworms and other baits but this type of fishing made up only about six percent of the angling effort.

Table 4. The foods of 44 brook trout, 12 kokanee, and 2 mountain whitefish from Mackay Reservoir, 1974, expressed as percentage of volume

Species:	<u>Brook trout</u>	<u>Kokanee</u>	<u>Mountain whitefish</u>
Volume of food (grams):	35.9	5.0	2.2
Food items:			
Plant material	trace	-	-
Leeches	3	-	32
Earthworms	10	-	-
<u>Daphnia</u>	2	-	-
Scuds	trace	-	-
Mayfly nymphs	2	2	-
Stonefly nymphs	1	2	-
Caddisfly larvae	8	trace	-
Aquatic beetles	trace	-	-
Midge larvae & pupae	4	94	64
Terrestrial insects	trace	2	-
Clams	-	-	4
Speckled dace	62	-	-
Fish remains	8	-	-

Table 5. Relative popularity and efficiency of various terminal gear used by anglers at Mackay Reservoir during 1974. (Interviews totalling 3,179 hours for 1,444 rainbow trout, 133 brook trout and 36 kokanee)

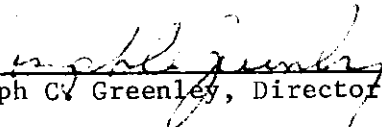
Terminal gear	<u>Percentage of:</u>		<u>Percentage of each Species</u>			Average Number Fish per Hour
	Effort	Catch	Rainbow	Brook	Kokanee	
Earthworms	72.5	67.1	64.8	94.0	63.9	0.47
Salmon eggs	1.4	1.1	1.2	0	0	0.39
Corn	0.4	0.4	0.3	1.5	0	0.46
Pop gear	19.2	23.9	25.8	1.5	30.6	0.63
Single spoon	5.6	6.7	7.1	2.3	5.6	0.60
Panther Martin	0.5	0.4	0.3	0.7	0	0.40
Flatfish	0.4	0.4	0.5	0	0	0.58

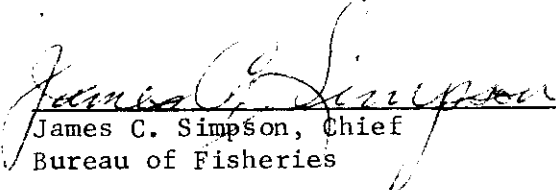
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